

IN THE CLAIMS

1. (Currently Amended) A method for identifying failures in a network, comprising:
detecting a port failure in a switch;
identifying one or more Media Access Control (MAC) addresses associated with the port failure; and
sending failure notifications using a gratuitous Address Resolution Protocol (ARP) reply to other ports on the switch that identify the one or more MAC addresses associated with the port failure;
wherein the failure notifications include the MAC addresses associated with the port failure[.];
wherein sending the gratuitous ARP reply is not in response to an ARP request;
wherein the gratuitous ARP reply causes a receiving network processing device to send out an ARP request for the MAC address in the gratuitous ARP reply and to route around an adjacency associated with the MAC address when no ARP reply is received in response to the ARP request.

2. (Original) A method according to claim 1 including:
providing multiple ports on the switch that are each connected to a same network processing device;
identifying when one or more of the multiple ports connected to the network processing device have failed; and
sending failure notifications to the other ports in the switch identifying each one of the multiple ports connected to the network processing device that have failed.

3. (Previously Presented) A method for identifying failures in a network, comprising:
detecting a port failure in a switch;
identifying one or more Media Access Control (MAC) addresses associated with the port failure;
sending failure notifications to other ports on the switch that identify the one or more MAC addresses associated with the port failure;
providing multiple ports on the switch that are each connected to a same network processing device;

identifying when one or more of the multiple ports connected to the network processing device have failed;
sending failure notifications to the other ports in the switch identifying each one of the multiple ports connected to the network processing device that have failed;
receiving failure notifications;
comparing the MAC address in the failure notifications with MAC adjacencies;
routing around an adjacency when the MAC address in one of the failure notifications matches the adjacency and there are no other MAC addresses associated with the adjacency;
routing around the adjacency when multiple MAC addresses in the failure notifications identify all MAC addresses associated with the adjacency; and
routing packets to a second MAC address associated with the adjacency when a first MAC address associated with the adjacency is identified in one of the failure notifications.

4. (Original) A method according to claim 1 including sending the failure notifications using a Cisco Discovery Protocol.

5. (Cancelled)

6. (Cancelled)

7. (Currently Amended) A method according to claim [[5]]1 including sending in the gratuitous ARP reply any combination of a null IP address, a null MAC address, or a zero hold time value.

8. (Original) A method according to claim 1 including using a heartbeat signal to detect the port failure.

9. (Previously Presented) A method according to claim 1 including configuring the switch to send the failure notifications only to the other ports in the switch coupled to routers or other switches.

10. (Currently Amended) A switch, comprising:
multiple ports that monitor for a communication failure with connected network processing devices; and
a processor that sends a failure notification out through the multiple ports when the communication failure is detected on one of the multiple ports[.];
wherein the failure notification includes a plurality of Media Access Control (MAC) addresses associated with the communication failure[.];
wherein the processor sends the failure notification in an Address Resolution Protocol reply message that includes a MAC address associated with the port detecting the communication failure and a zero hold time.

11. (Original) A switch according to claim 10 including a table that includes MAC addresses associated with the multiple ports, the processor including in the failure notification the MAC address in the table associated with the port detecting the communication failure.

12. (Original) A switch according to claim 10 including a port configuration table that identifies which ports the processor sends the failure notification.

13. (Original) A switch according to claim 10 wherein the multiple ports use a layer 1 network protocol to detect the communication failure.

14. (Original) A switch according to claim 13 wherein the layer 1 network protocol uses a heartbeat signal or a loss-of-light detector to detect the communication failure.

15. (Previously Presented) A switch according to claim 10 including additional multiple ports on the switch connected to a first network processing device, the processor sending a separate failure notification for each one of the additional multiple ports connected to the first network processing device detecting a failure.

16. (Original) A switch according to claim 10 wherein the switch operates at layer 2 of an OSI model and the network processing devices operate at layer 3 of the OSI model.

17. (Cancelled)

18. (Original) A switch according to claim 10 wherein the switch is an Ethernet switch for coupling to multiple routers.

19. (Previously Presented) A switch according to claim 18 including additional ports on the switch for coupling to personal computers over a VLAN connection.

20. (Currently Amended) Computer code stored on a computer readable medium for identifying failures in a network, the computer readable medium[[.]] comprising:

code adapted to detect a port failure in a switch;

code adapted to identify one or more Media Access Control (MAC) addresses associated with the port failure; and

code adapted to send failure notifications including the one or more MAC addresses to other ports on the switch that identify the MAC addresses associated with the port failure[[.]];

code adapted to send the failure notifications using a gratuitous Address Resolution Protocol (ARP) reply; and

code adapted to generate the gratuitous ARP reply so that a receiving network processing element will send out an ARP request for the MAC address in the gratuitous ARP reply and route around the adjacency associated with the MAC address when no ARP reply is received in response to the ARP request.

21. (Currently Amended) A computer readable medium according to claim 20 including:

code adapted to identify when multiple ports connected to ~~the~~ a network processing device have failed; and

code adapted to send failure notifications to the other ports in the switch identifying each one of the multiple ports that have failed.

22. (Currently Amended) Computer code stored on a computer readable medium for identifying failures in a network, the computer readable medium[[.]] comprising:

code adapted to detect a port failure in a switch;

code adapted to identify one or more Media Access Control (MAC) addresses associated with the port failure;

code adapted to send failure notifications to other ports on the switch that identify the MAC addresses associated with the port failure;

code adapted to identify when multiple ports connected to the network processing device have failed;

code adapted to send failure notifications to the other ports in the switch identifying each one of the multiple ports that have failed;

code adapted to receive failure notifications;

code adapted to compare the MAC address in the failure notifications with MAC adjacencies;

code adapted to route around an adjacency when the MAC address in one of the failure notifications matches the adjacency and there are no other MAC addresses associated with the adjacency;

code adapted to route around an adjacency when multiple MAC addresses in the failure notifications identify all MAC addresses associated with the adjacency; and

code adapted to route packets to a different MAC address associated with the adjacency when the MAC address in the failure notifications is associated with the adjacency.

23. (Original) A computer readable medium according to claim 21 including code adapted to send the failure notifications using a Cisco Discovery Protocol.

24. (Cancelled)

25. (Cancelled)

26. (Currently Amended) A computer readable medium according to claim ~~[[24]]~~²⁰ including code adapted to send in the gratuitous ARP reply any combination of a null IP address, a null MAC address, or a zero hold time value.

27. (Original) A computer readable medium according to claim 21 including code adapted to use a heartbeat signal to identify a port failure.

28. (Previously Presented) A computer readable medium according to claim 21 including code adapted to configure the switch to send the failure notifications only to the other ports in the switch coupled to routers or other switches.

29. (Currently Amended) A system for identifying failures in a network, comprising:
means for detecting a port failure in a switch;
means for identifying one or more Media Access Control (MAC) addresses associated with the port failure; ~~and~~
means for send failure notifications including the one or more MAC addresses to other ports on the switch that identify the MAC addresses associated with the port failure[.];
means for sending the failure notifications using a gratuitous Address Resolution Protocol (ARP) reply; and
means for generating the gratuitous ARP reply so that a receiving network processing element will send out an ARP request for the MAC address in the gratuitous ARP reply and route around the adjacency associated with the MAC address when no ARP reply is received in response to the ARP request.

30. (Original) A system according to claim 29 including:
means for identifying when multiple ports connected to the network processing device have failed; and
means for sending separate failure notifications to the other ports in the switch identifying each one of the multiple ports connected to the network processing device that have failed.

31. (Previously Presented) A system for identifying failures in a network, comprising:
means for detecting a port failure in a switch;
means for identifying one or more Media Access Control (MAC) addresses associated with the port failure;
means for send failure notifications to other ports on the switch that identify the MAC addresses associated with the port failure;
means for identifying when multiple ports connected to the network processing device have failed;

means for sending separate failure notifications to the other ports in the switch identifying each one of the multiple ports connected to the network processing device that have failed;

means for receiving failure notifications;

means for comparing the MAC address in the failure notifications with MAC adjacencies;

means for routing around an adjacency when the MAC address in one of the failure notifications matches the adjacency and there are no other MAC addresses associated with the adjacency;

means for routing around the adjacency when multiple MAC addresses in the failure notifications identify all MAC addresses associated with the adjacency; and

means for routing packets to a different MAC address associated with the adjacency when the MAC address in the failure notifications is associated with the adjacency.

32. (Original) A system according to claim 29 including means for sending the failure notifications using a Cisco Discovery Protocol.

33. (Cancelled)

34. (Cancelled)

35. (Currently Amended) A system according to claim ~~[[33]]~~29 including means for sending in the gratuitous ARP reply any combination of a null IP address, a null MAC address, or a zero hold time value.

36. (Original) A system according to claim 29 including means for using a heartbeat signal to identify a port failure.

37. (Previously Presented) A system according to claim 29 including means for configuring the switch to send the failure notification only to the other ports in the switch coupled to routers or other switches.

38. (Currently Amended) A network processing device, comprising:
one or more ports for communicating and receiving failure notifications from a switch, the failure notifications including a MAC address associated with a port on the switch that has failed; and

a processor that reroutes around an adjacent network processing device on the switch associated with the MAC address in the failure notification[.];

wherein the failure notification is received via a gratuitous Address Resolution Protocol (ARP) reply, the processor sending out an ARP request for the MAC address contained in the gratuitous ARP reply and rerouting around the adjacent network processing device associated with the MAC address when no ARP response is received responsive to the ARP request.

39. (Original) A network processing device according to claim 38 including an adjacency table that identifies MAC addresses for adjacent network processing devices connected to the switch, the processor routing around any MAC address in the adjacency table matching the MAC address in the failure notification.

40. (Cancelled)

41. (Currently Amended) A network processing device according to claim 38 wherein [[an]] the adjacent network processing device has multiple ports coupled to the switch, the processor routing around the adjacent network processing device only when the failure notifications identify failures on all of the ports on the switch coupled to the adjacent network processing device.

42. (Currently Amended) A method for fast failure detection, comprising:
receiving a failure notification from a switch, the failure notification including a MAC address associated with a port on the switch that has failed; and
routing around an adjacent network processing device associated with the MAC address in the failure notification[.];

receiving the failure notification via a gratuitous Address Resolution Protocol (ARP) reply;

sending out an ARP request for the MAC address contained in the gratuitous ARP reply; and

routing around an adjacent network processing device associated with the MAC address when no ARP response is received for the ARP request.

43. (Cancelled)

44. (Original) A method according to claim 42 including:

identifying an adjacent network processing device having multiple ports coupled to the switch; and

routing around the adjacent network processing device when the failure notification identifies failures on all of the ports on the switch coupled to the adjacent network processing device.

45. (Currently Amended) Computer code stored on a computer readable medium for identifying failures in a network, comprising:

code adapted to receive failure notifications from a switch, the failure notification including a MAC address associated with a port on the switch that has failed; and

code adapted to route around an adjacent network processing device associated with the MAC address in the failure notification[.];

code adapted to receive the failure notification via a gratuitous Address Resolution Protocol (ARP) reply;

code adapted to send out an ARP request for the MAC address contained in the gratuitous ARP reply; and

code adapted to route around an adjacent network processing device associated with the MAC address when no ARP response is received for the ARP request.

46. (Cancelled)

47. (Currently Amended) A computer readable medium according to claim [[46]]⁴⁵ including:

code adapted to identify an adjacent network processing device having multiple ports coupled to the switch; and

code adapted to route around the adjacent network processing device when the failure notification identifies failures on all of the ports on the switch coupled to the adjacent network processing device.

48. (Currently Amended) A system for identifying failures in a network, comprising:
means for receiving a failure notification from a switch, the failure notification including a MAC address associated with a port on the switch that has failed; and
means for routing around an adjacent network processing device associated with the MAC address in the failure notification[.];
means for receiving the failure notification via a gratuitous Address Resolution Protocol (ARP) reply;
means for sending out an ARP request for the MAC address contained in the gratuitous ARP reply; and
means for routing around an adjacent network processing device associated with the MAC address when no ARP response is received for the ARP request.

49. (Cancelled)

50. (Original) A system according to claim 48 including:
means for identifying an adjacent network processing device having multiple ports coupled to the switch; and
means for routing around the adjacent network processing device when the failure notification identifies failures on all of the ports on the switch coupled to the adjacent network processing device.

51. (Previously Presented) A method according to claim 1 including:
receiving one of the failure notification messages in a router; and
comparing the MAC addresses in the failure message with MAC adjacencies in the router.

52. (Currently Amended) A method of identifying network failures, comprising:
receiving failure notifications;
comparing a Media Access Control (MAC) address in the failure notifications with MAC adjacencies; and
routing around an adjacency when the MAC address in one of the failure notifications matches the adjacency and there are no other MAC addresses associated with the adjacency[.]; and

routing packets to a second MAC address associated with the adjacency when a first MAC address associated with the adjacency is identified in one of the failure notifications.

53. (Previously Presented) A method according to claim 52 including routing around the adjacency when multiple MAC addresses in the failure notifications identify all MAC addresses associated with the adjacency.

54. (Cancelled)